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# PRE SHOPPING ACTIVITIES AND THEIR INFLUENCE ON AMOUNT OF FOOD WASTE GENERATED AT HOUSEHOLD LEVEL IN URBAN AREA OF ALBANIA: AN ECONOMETRIC APPROACH

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**Abstract**

*Consumers play an important role for the reduction of food waste, not only because a large proportion of waste occurs at household level, but also because all activities along the food chain are targeted to the end-consumer. In this study we focus on the pre-shopping stage that households might engage in behaviors, such as checking their stocks, making shopping lists or planning their meals in advance, which negatively influence the amount of food waste generated at the household level. We estimate how does the planning of food purchased, monthly income growth, the feeling or not of being guilty about food waste and level of interest in the importance of the food waste, affect the value of food thrown over a week. The increase in the monthly family's income affects the decrease of chance to make planning list before purchasing. In our study we uses interview method with the aim of measuring what foodstuffs have been purchased and which*

*have been ingested by the consumers at household level. Consumer information and education are crucial measures helping influence consumers' behavior. There is a wide variety of awareness aiming to draw consumers' attention to the issue of food wastage increasing their respect for food.*

*Keywords: Food waste, consumer, households, values, planning*

## INTRODUCTION

### Food Waste Definition

There is still no definition widely accepted of what food waste means and until now different studies have been using different definitions. One of the first definitions given to food waste includes in this term "all food purchased or produced at home that is not actually ingested by humans" (Gallo 1980). At the household level, food waste represents any food that is brought in the home but is not consumed by humans (DEFRA 2010). Thus, in early stages only two types of food waste were defined. Later on, the Waste & Resources Action Program (WRAP) in UK, took the next step and categorized the food waste as avoidable; possibly avoidable and unavoidable (WRAP 2009). The correspondence between the early defined categories of food waste and the most recent ones is the following: the avoidable and possibly avoidable categories correspond to the edible food waste category while the unavoidable food waste corresponds to the inedible food waste (WRAP 2009). Over the time, numerous definitions have been given to the concept of food waste. However, there is a lack of consistency between the definitions used in different studies. Our study, at the consumer level, is widely concentrated in the research conducted by WRAP, based on similar definitions and categorization of food waste at household level.

### Food Waste Estimates Methods

The studies aimed at quantifying or estimating the amount of food waste in different countries represents the great majority of the existing literature regarding food waste (Adelson et al. 1963, Dowler 1977, Wenlock and Buss 1980, van Garde and Woodburn 1987, Pecan et al. 2006, WRAP 2008, Griffin et al. 2009, WRAP 2009, Hall et al. 2009). The vast majority of these studies have been conducted in the developed countries, where the food gets often wasted because it is abundant and rather cheap. However, recently, studies in less developed countries have emerged as well (e.g. Pecan et al. 2006 in Turkey). The wide range of results could be explained, to some extent, by the differences in the definitions and methods of measurement employed. The great majority of the studies in this field look at waste in the consumer segment of the food system. While very few studies have looked at food waste across the entire food

system, estimating food losses in the various segments of the system (e.g. Kantor 1997). The segment which recently started to receive most attention is the food waste at the household level (WRAP 2008, 2009). The 4 primary methods used to measure food waste include the diary method, archaeological excavations, plate examinations and the inferential method (Gallo 1980). We use the inferential method implies the comparison of the total quantity of food which enters the household with the food that is actually eaten by the householders. In our study we uses interview method with the aim of measuring what foodstuffs have been purchased and which have been ingested by the consumers at household level. Inferential method has been applied in more recent studies due to its advantages, such as the fact that it is a nonreactive method, because no mention of food waste is made to the consumer, and that it allows for all types of food waste to be accounted for (Gallo 1980, Muth et al. 2007, Hall et al. 2009).

**Research Objectives**

These studies have tried to identify consumers' attitudes, values and behaviors related to food and how these influence their food waste behavior. In this study we focus on the pre-shopping stage that households might engage in behaviors, such as checking their stocks, making shopping lists or planning their meals in advance, which might negatively influence the amount of food waste generated at the household level. People who do not check their stocks prior to the shopping trip are put in the position of estimating their inventory from memory, when they make the purchase decisions in the stores. Overstocking is an important contributor to food waste since it increases spoilage of food in the overstocked categories, while stock outs lead to unmet demands. How pre-shopping activities as planning are affecting food wasting? We estimate how does the planning of food purchased, monthly income growth, the feeling or not being guilty about food waste and level of interest in the importance of the food waste; affect the value of food thrown over a week. How the increase in the monthly families income affect in the change of chance to make planning list before purchasing compared with not planning?

**Research Hypotheses**

**H1:** The pre-shopping activities are expected to positively influence the behavioral intention not to throw food away.

**H2 :** Higher levels of awareness regarding the amount and impact of food waste among, influence the behavioral intention not to throw away food, which is expected to negatively influence the food waste.

**H3:** The increase in the monthly families' income affect the change of chance of making planning list before purchasing compared to not planning.

## METHODOLOGY

In total, 350 fully completed questionnaires were collected during the data collection process. The number of respondents is sufficient to generate a sample with a good statistical power. As Tabachnick and Fidell (2007) explain, for regression analysis, the minimum sample size can be determined by the formula: 50+5*m, where m is the number of independent variables. As it can be seen later, the total number of independent variables (composite variables + demographic ones) is 34, which results in a required minimum of 220 respondents. In order to construct a quota sample, several steps are to be implemented in the data collection process: 1) The population is divided in specific groups; 2) A quota is calculated for each of the groups based on the available data; 3) The number of cases which are required for each quota is chosen; 4) All the data is combined, so that the full sample is provided (Saunders et al., 2009). The choice of quota sampling is justified by the number of advantages that it provides over the probabilistic techniques. In general, it is less costly and can be implemented quickly. Moreover, quota sampling does not require sampling framework and it works well with large sample sizes (Saunders et al.,2009). For the purposes of this study, the main objective was to construct a sample that matched the population in terms of age distribution. If age is represented by the sample accurately, it can also be suggested that the characteristics of the remaining population included in the survey (household size, number of children, income and education) are to be relatively well matched, as well. It should be also clarified that respondents aged 70+ are excluded from the analysis. Limiting the focus on the households comprised by individuals within the age boundaries of 18-70 is suggested to produce more relevant and accurate data that objectively reflects the existing reality.

Table 1: Population and sample characteristics

| | Sample | | Urban Population | |
|---|---|---|---|---|
| Age group | Nr | % | Nr | % |
| 18-25 | 75 | 23 | 297365 | 24 |
| 25-35 | 59 | 18 | 238973 | 19 |
| 35-45 | 68 | 20 | 201366 | 16 |
| 45-55 | 75 | 22 | 241605 | 20 |
| 55-65 | 44 | 13 | 192918 | 16 |
| 65-70 | 14 | 4 | 62157 | 5 |
| Total | 335 | 100 | 1234384 | 100 |

Source: National Statistical Institute and authors calculations

We used gretl 2015d, other linear models heteroscedasticity correction; one factor ANOVA methods and SPSS 23 for parameter estimation of logistic regression.

## DELIMITATIONS

There are few aspects of the food waste problem which cause certain limitations while investigating the issue in its depth. One of the significant obstacles for fully revealing the food waste problem originates from the complexity of the food production, distribution, consumption chains. Another potential limitation of the current study is the complete lack of statistical data about the food waste in Albania considering the fact that, no previous research has been done on the topic in local context. This poses serious limitations in understanding the prevailing food practices of the Albanian consumers, as well as a lack of punctuality in assessing the magnitude of the food waste problem in the country. The implementation of household surveys is methodically simple, but usually it can provide only qualitative information, because quantitative estimates out of memory regarding the weight of the food purchased and discarded are very prone to error (Schneider 2008). Experience also teaches that consumers substantially underestimate their losses when self-reporting (Beretta et al. 2013).

## RESULT

Tables 2: Research Variables

| Name of variable | Symbol | type | measure | Scale | role |
|---|---|---|---|---|---|
| Value of food waste per week | Value | numeric | scale | ALL/week | output |
| Income per month | Income | numeric | scale | ALL/month | input |
| Interest in the importance of the food being thrown away | Interest | numeric | ordinal | 3 Very interested<br>2 Interested<br>1 I have little interest<br>0 I'm not really interested | Input |
| Consider of food stock, waste of food before shopping planning | Planning | string | nominal | 0 Yes<br>1 No | Input (Output) |
| Feeling guilty about buying more than you need | Feeling | string | nominal | 1 Yes<br>2 No | input |
| Residence | Zonaqenderbperiferi | numeric | nominal | 0 center<br>1 periphery | input |
| Number of workers per family | Nrpunesuarve | numeric | scale | 0,1,2,3,4,5,6 :number | Input |

Table 3 : Summary Statistics, using the observations 1 - 336
for the variable VALUE (334 valid observations)

| Mean | Median | Minimum | Maximum |
|---|---|---|---|
| 685.629 | 750.000 | 250.000 | 1750.00 |
| Std. Dev. | C.V. | Skewness | Ex. kurtosis |
| 454.758 | 0.663272 | 0.783905 | -0.277565 |
| 5% Perc. | 95% Perc. | IQ range | Missing obs. |
| 250.000 | 1750.00 | 500.000 | 2 |

Table 4: Descriptive Statistics Value: Value of food waste per week (VALUE)

| | | | | Bootstrap[a] | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | 95% Confidence Interval | |
| | | Statistic | Std. Error | Bias | Std. Error | Lower | Upper |
| 10 VLERA | N | 334 | | 0 | 0 | 334 | 334 |
| | Range | 1500.0 | | | | | |
| | Minimum | 250.0 | | | | | |
| | Maximum | 1750.0 | | | | | |
| | Mean | 685.629 | | -.045 | 24.672 | 637.725 | 733.533 |
| | Std. Deviation | 454.7580 | | -1.2202 | 16.0410 | 422.3973 | 485.3782 |
| | Variance | 206804.859 | | -851.043 | 14544.579 | 178419.517 | 235592.041 |
| | Skewness | .787 | .133 | -.004 | .085 | .620 | .954 |
| | Kurtosis | -.264 | .266 | .004 | .194 | -.600 | .150 |
| Valid N (listwise) | N | 334 | | 0 | 0 | 334 | 334 |

a. Unless otherwise noted, bootstrap results are based on 5000 bootstrap samples

Table.5: Model 1: Heteroskedasticity-corrected, using observations 1-336 (n = 325)

Missing or incomplete observations dropped: 11

Dependent variable: VALUE

| | *Coefficient* | *Std. Error* | *t-ratio* | *p-value* | |
|---|---|---|---|---|---|
| const | 1172.35 | 144.826 | 8.0949 | <0.0001 | *** |
| INTEREST | −105.385 | 24.0818 | −4.3761 | <0.0001 | *** |
| PLANING | −173.833 | 55.8677 | −3.1115 | 0.0020 | *** |
| FEELING | −0.864722 | 48.4364 | −0.0179 | 0.9858 | |
| INCOME | 0.00193938 | 0.000452012 | 4.2906 | <0.0001 | *** |
| Zone of residence | −43.7644 | 57.6949 | −0.7585 | 0.4487 | |
| Number or workers | −14.4923 | 28.2593 | −0.5128 | 0.6084 | |

Table 6: Statistics based on the weighted data:

| | | | |
|---|---|---|---|
| Sum squared resid | 1009.016 | S.E. of regression | 1.781294 |
| R-squared | 0.237454 | Adjusted R-squared | 0.223067 |
| F(6, 318) | 16.50405 | P-value(F) | 1.44e-16 |
| Log-likelihood | −645.2523 | Akaike criterion | 1304.505 |
| Schwarz criterion | 1330.991 | Hannan-Quinn | 1315.075 |

Table 7: Statistics based on the original data:

| | | | |
|---|---|---|---|
| Mean dependent var | 688.4615 | S.D. dependent var | 457.3448 |
| Sum squared resid | 57166631 | S.E. of regression | 423.9921 |

Table 8: Model 2: Heteroskedasticity-corrected, using observations 1-336 (n = 333)
Missing or incomplete observations dropped: 3
Dependent variable: VALUE

| | *Coefficient* | *Std. Error* | *t-ratio* | *p-value* | |
|---|---|---|---|---|---|
| const | 1229.9 | 148.501 | 8.2821 | <0.0001 | *** |
| INTEREST | −100.278 | 25.7952 | −3.8875 | 0.0001 | *** |
| PLANING | −184.201 | 61.8761 | −2.9769 | 0.0031 | *** |
| FEELING | −81.7699 | 49.3083 | −1.6583 | 0.0982 | * |
| INCOME | 0.00179427 | 0.000365783 | 4.9053 | <0.0001 | *** |

Table 9: Statistics based on the weighted data

| | | | |
|---|---|---|---|
| Sum squared resid | 1015.687 | S.E. of regression | 1.759718 |
| R-squared | 0.175753 | Adjusted R-squared | 0.165701 |
| F(4, 328) | 17.48469 | P-value(F) | 5.11e-13 |
| Log-likelihood | −658.1837 | Akaike criterion | 1326.367 |
| Schwarz criterion | 1345.408 | Hannan-Quinn | 1333.960 |

Table 10: Statistics based on the original data

| | | | |
|---|---|---|---|
| Mean dependent var | 686.9369 | S.D. dependent var | 454.8125 |
| Sum squared resid | 57689044 | S.E. of regression | 419.3820 |

Table 11: Analysis of Variance, response = VALUE,
treatment = Zonaaqenderbperiferi (Zone of residence)

| | Sum of squares | df | Mean square |
|---|---|---|---|
| Treatment | 4.14652e+006 | 1 | 4.14652e+006 |
| Residual | 6.47153e+007 | 331 | 195515 |
| Total | 6.88619e+007 | 332 | 207415 |

F(1, 331) = 4.14652e+006 / 195515 = 21.2082 [p-value 5.88e-006]

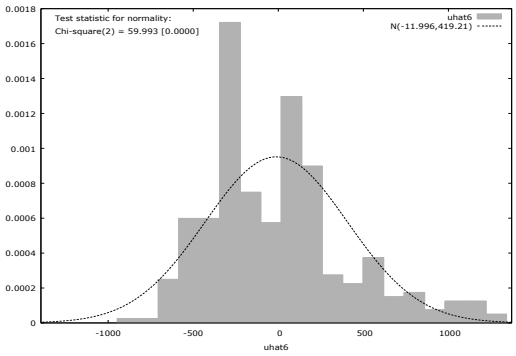
| Level | n | mean | std. dev |
|---|---|---|---|
| 0 | 49 | 954.082 | 394.21 |
| 1 | 284 | 639.085 | 449.80 |

Table.12: Analysis of Variance, response = VALUE,
treatment = Nrpunesuarve (Number of workers per family)

| | | | |
|---|---|---|---|
| Treatment | 2.71654e+006 | 6 | 452757 |
| Residual | 6.50565e+007 | 319 | 203939 |
| Total | 6.7773e+007 | 325 | 208532 |

Test for normality of residual - Null hypothesis: error is normally
Test statistic: Chi-square (2) = 53.6537 distributed with p-value = 2.23487e-012

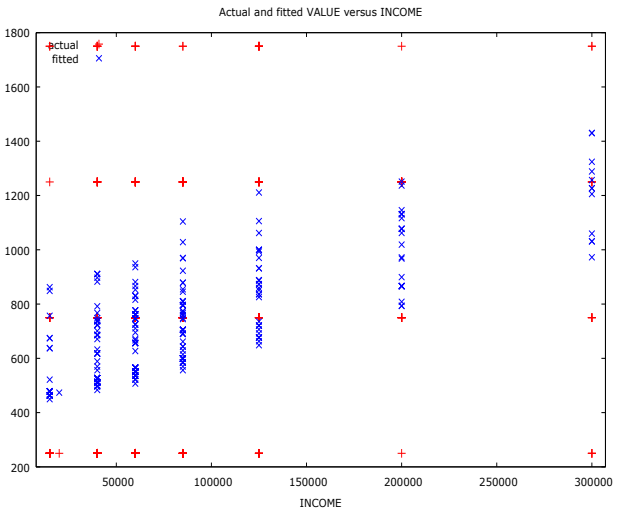
Graph 1: Test for error normality



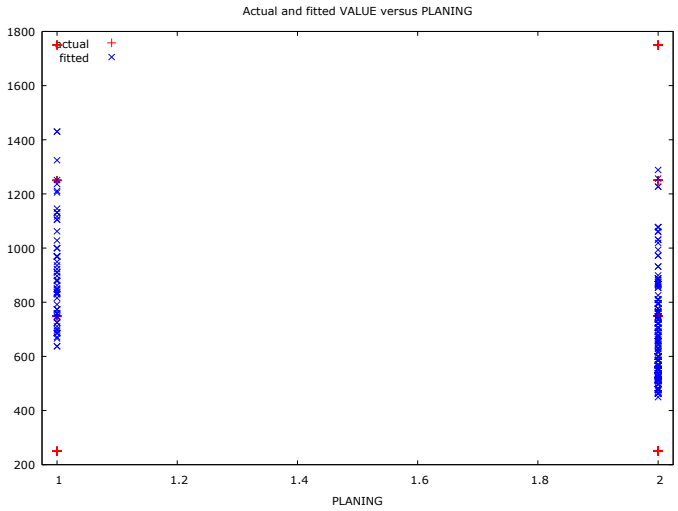

F(6, 319) = 452757 / 203939 = 2.22006
[p-value 0.0410]

| Level | n | mean | std. dev |
|---|---|---|---|
| 0 | 1 | 750 | NA |
| 1 | 57 | 653.509 | 476.58 |
| 2 | 181 | 645.028 | 447.25 |
| 3 | 61 | 864.754 | 450.86 |
| 4 | 18 | 638.889 | 471.40 |
| 5 | 7 | 607.143 | 243.98 |
| 6 | 1 | 1250 | NA |

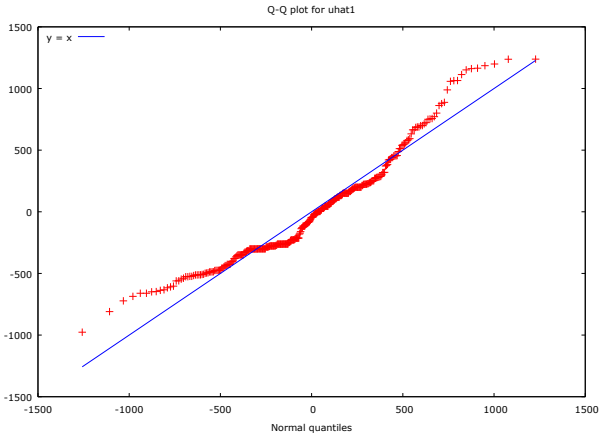
Graph 2: Actual and fitted Value: Income



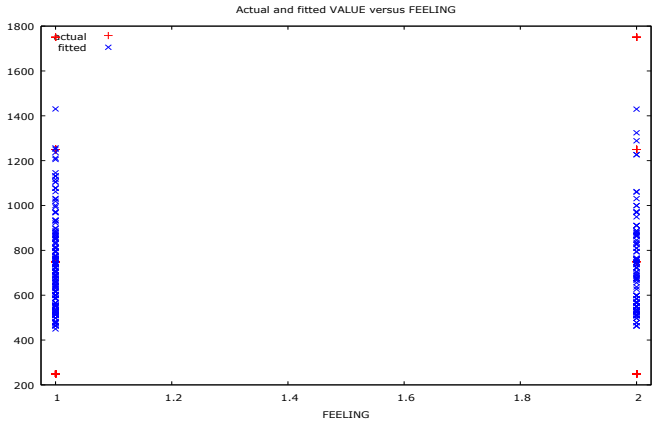

Graph 3: Actual and fitted Value: planning



Graph 4: Q-Q plot




Graph.5 Actual and fitted feeling




Graph.6: Actual and fitted Value: Interest

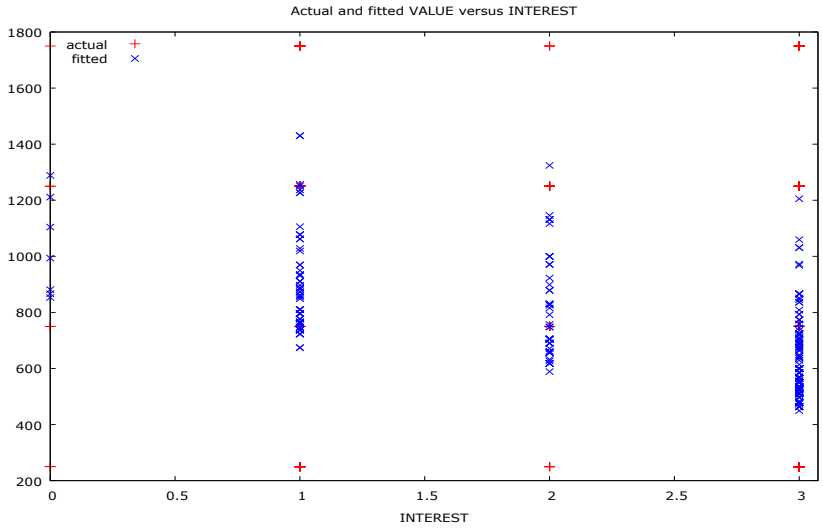



Table 13: Case Processing Summary

| Unweighted Cases[a] | | N | Percent |
|---|---|---|---|
| Selected Cases | Included in Analysis | 334 | 99.4 |
| | Missing Cases | 2 | .6 |
| | Total | 336 | 100.0 |
| Unselected Cases | | 0 | .0 |
| Total | | 336 | 100.0 |

a. If weight is in effect, see classification table for the total number of cases.

Table 14: Dependent Variable Encoding

| Original Value | Internal Value |
|---|---|
| No | 0 |
| yes | 1 |

Table 15: Classification Table[a,b]

| | | | Predicted | | |
|---|---|---|---|---|---|
| | | | Planning | | Percentage |
| | Observed | | no | yes | Correct |
| Step 0 | Planning | no | 0 | 72 | .0 |
| | | yes | 0 | 262 | 100.0 |
| | Overall Percentage | | | | 78.4 |

a. Constant is included in the model.

b. The cut value is .500

Table 16: Variables in the Equation

| | | B | S.E. | Wald | df | Sig. | Exp(B) |
|---|---|---|---|---|---|---|---|
| Step 0 | Constant | 1.292 | .133 | 94.232 | 1 | .000 | 3.639 |

Table 17: Variables not in the Equation

| | | | Score | df | Sig. |
|---|---|---|---|---|---|
| Step 0 | Variables | INCOME | 4.793 | 1 | .029 |
| | Overall Statistics | | 4.793 | 1 | .029 |

Table 18: Omnibus Tests of Model Coefficients

| | | Chi-square | df | Sig. |
|---|---|---|---|---|
| Step 1 | Step | 4.695 | 1 | .030 |
| | Block | 4.695 | 1 | .030 |
| | Model | 4.695 | 1 | .030 |

Table 19: Model Summary

| Step | -2 Log likelihood | Cox & Snell R Square | Nagelkerke R Square |
|---|---|---|---|
| 1 | 343.494[a] | .014 | .022 |

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Table 20: Variables in the Equation

| | | B | S.E. | Wald | df | Sig. | Exp(B) |
|---|---|---|---|---|---|---|---|
| Step 1[a] | INCOME | -.191 | .088 | 4.716 | 1 | .030 | .826 |
| | Constant | 1.961 | .345 | 32.232 | 1 | .000 | 7.107 |

a. Variable(s) entered on step 1: INCOME.

**DISCUSSION**

The average value of food thrown for one week for an urban household is 685,6ALL ranging from 637.7 ALL to 733.5 ALL. The interval estimation was made based on the bootstrapping method. The implementation of household surveys is methodically simple, but usually it can provide only qualitative information, because quantitative estimates out of memory regarding the weight of the food purchased and discarded are very prone to error. Experience also teaches that consumers substantially underestimate their losses when self-reporting: That's why it is expected that our R-squared values to be low. In the model 1: R-squared =0.237454 and Adjusted R-squared = 0.223067; in the model 2: R-squared = 0.175753and Adjusted R-squared = 0.165701.If R-squared value is low but have statistically significant predictors, we can still draw important conclusions about how changes in the predictor values are associated with changes in the response value. Regardless of the R-squared, the significant coefficients still represent the mean change in the response for one unit of change in the predictor while holding other predictors in the model constant. Obviously, this type of information can be valuable. A low R-squared is problematic when we want to make predictions that are reasonably precise. The most important factor affecting the value of food thrown in a week is interest in the importance of the food being thrown away followed by consider of food stock and waste of food before planning to do shopping, the monthly income factor and feeling guilty about buying more than need. Growing with a degree of interest for food waste is associated with a moderate decrease in the value of food thrown for a week by - 100ALL or – 15%. If the monthly family

income increases by an average of 10.000 ALL per month, the value of food thrown for a week in a family is expected to increase by 18 ALL or +1,8‰, while other factors remain unchanged. Families that consider waste and food stock while planning food purchases for the future throw −184 ALL or -26% less per week compared to households that do not consider the waste and food stock while planning food purchases for the future. Families who feel responsible for buying larger amounts of food compared to their needs throw −82 ALL or -12% per week less foods compared to those families who do not feel responsible. The analysis of the results of Table.5 shows that the variables residence zone and the number of employees have a p. value of 0.4487 and 0.6084 and are considered statistically unimportant in relation to the impact on the food waste value variable thrown by one family for a week. However, Table 10; 11 of one factor ANOVA show that two variables are statistically significant in the effect of the variation of the dependent variables: the value of food thrown by one family for a week. A more detailed study and analysis on this issue remains open in the future. We evaluate how the increase in the monthly family affects the change of chance to make planning list before purchasing compared to not planning using logistic regression:

$$p = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X)}}$$

The probability of family planning a shopping list is: $$p = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X)}}$$

The probability of family not planning shopping lists is: =1-p.

We have been estimate value of $b_0$ and $b_1$. After that we can calculate odds ratio. SPSS reports the odds as *Exp (B).* From the table .19 we see the Exp(B) for variable INCOME is=0,826 telling that: When income increase by one unit, the chance to make planning and consider the stock before purchasing compared to not planning and not considering the stock before purchasing decrease with -17,4%.

**IMPLICATIONS FOR PRACTICE**

A more responsible and efficient use of the food produced would result in a saving of resources in terms of land, water, energy, equipment and labor. Based on analysis of (Gerstberger & Yaneva), it can be assumed that countries as Albania, spending a relatively large proportion of household income on food, are more careful and economical use of these goods. Refer the conclusion of the study, while monthly family income increase by one unit, the chance to make planning compared with not planning and not considering the stock before purchasing decreases -17,4%.We expect increase on food waste as family income are increasing in the future. Consumer information and education are crucial measures helping influence consumers'

behavior. There is a wide variety of awareness aiming to draw consumers' attention to the issue of food wastage and to increase their respect for food. In this context, a number of workshops must designed, including purchase planning, cooking without excess, conserving food and cooking with leftovers. Food redistribution program is a tool to use this surplus in an efficient way and to the benefit of economically deprived people. The main barriers to food redistribution are related to a lack of infrastructure as well as economic and legal constraints. A mandatory separate collection of food waste followed by a tax rate high enough to create a sufficiently strong incentive for waste minimization as well as for the donation of surplus food will reduce food waste in the future.

## REFERENCES

Adelson, S., Delaney, I., Miller, C. and Noble, I. 1963 Discard of edible food in households.

Bank of Albania official exchange rate USD/ALL 121,51

Gallo, A.E. 1980. Consumer food waste in the United States. National Food Review 3 (12): 13–16.

FAO (1981): Food loss prevention in perishable crops. Food and Agriculture Organization of the United Nations (FAO), Rome

Department of Environment, Food and Rural Affairs (DEFRA) 2010. Household Food and Drink Waste linked to Food and Drink Purchases. http://www.defra.gov.uk/statistics/files/defra-stats-foodfarm-food-foodwastepurchases- 100727.pdf

Dowler, E. 1977 A pilot survey of domestic food wastage. Journal of Human Nutrition, Vol. 31, pp. 171

Griffin, M., Sobal, J. & Lyson, T. A. 2009 An analysis of a community food waste stream. Agric. Hum. Values 26, 67–81.

Gallo, A.E. 1980. Consumer food waste in the United States. National Food Review 3 (12): 13–16.

Hall, K. D., Guo, J., Dore, M. & Chow, C.C. 2009 The progressive increase of food waste in America and its environmental impact. PLoS ONE 4, e7940.

Kantor, L.S., K. Lipton, A. Manchester, and V. Oliveria. 1997. Estimating and addressing America's food losses. Food Review 20 (1): 2–12.

Muth, M.K., Kosa, K.M., Nielsen, S.J. and Karns, S.A. 2007. Exploratory Research on Estimation of Consumer-Level Food Loss Conversion Factors. RTI International for Jean Buzby, U.S. Department of Agriculture, Economic Research Service. RTI Project Number 0210449.000.001.

INSTAT Census, 2011

Pekcan, G., Köksal, E., Küçükerdönmez, O. & Ozel, H. 2006 Household food wastage in Turkey. Rome, Italy : FAO.

Saunders, M., Lewis, P. & Thornhill, A. 2009, Research Methods for Business Students, Prentice Hall, 5th edition.

Tabachanick, B.G. and Fiddell, L.S. 2007. Using Multivariate Statistics. Pearson Education, Inc.

Van Garde, S. J. & Woodburn, M. J. 1987 Food discard practices of householders. Journal of the American Dietetic Association, Vol. 87, No.3, pp. 322–329.

Wenlock, R., Buss, D., Derry, B. & Dixon, E. 1980 Household food wastage in Britain. British Journal of Nutrition, Vol. 43, pp. 53–70.

WRAP. 2008 The food we waste. Banbury, UK. ISBN: 1- 84405-383-0.

WRAP. 2009 Household food and drink waste in the UK. Banbury, UK. ISBN: 1-84405-430-6.